

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of	)	Examiner: Rodney B. White
	)	
James J. Johnston	)	Group Art Unit: 3742
	)	
on CARBON FIBER HEATING	)	
ELEMENT ASSEMBLY AND METHODS	)	
FOR MAKING	)	
	)	Confirmation No.: 5776
Patent No.: 7,247,822 B2	)	
	)	
Issued: July 24, 2007	)	(Docket No. 6884-0014)

Hartford, Connecticut, August 16, 2007

Attn: Certificate of Corrections Branch  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**REQUEST FOR CERTIFICATE OF CORRECTION UNDER 37 C.F.R. 1.323**

Dear Sir:

In proofreading the above-referenced patent, an error was noted which is believed to possibly lead to confusion and/or mistake. Accordingly, the issuance of a Certificate of Correction is requested under Rule 1.323.

In the claims, Column 10, line 4, cancel the text beginning with "28. A method of making" to and ending "along its axial length." in column 10, line 18.

28. A method of making a heating element assembly comprising the steps of; continuously advancing an axially elongated first web of dielectric sheet material in an axial direction, simultaneously continuously advancing an axially elongate carbon fiber tow in said axial direction, moisturizing the tow, guiding the tow into axial alignment and overlying adhering engagement with the advancing first web, adhering the tow to the advancing first web, continuously advancing a second web of

dielectric sheet material into overlying relation with marginal portions of the first web and the tow adhered to the first web, and joining only axially extending marginal portions of the first and second webs in face-to-face sealing engagement with each other to form an outer sheath containing the tow and embracing the tow along its axial length.

Enclosed please find Form PTO/SB/44 indicating the requested changes.

In the Office Action mailed on January 26, 2005, the Examiner withdrew claim 28 from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected claim. Election was made without traverse by Mr. J. Linderman by phone on January 18, 2004 (see enclosed copy of the Office Action mailed 1/26/2005). In Applicant's Response to the Office Action dated May 26, 2005, claim 28 was withdrawn as follows (see copy of the Response to the Office Action enclosed).

As these errors are on the part of the Patent Office, Patentee believes no fee is due for filing this request. However, if it is determined that a fee is required, please charge Deposit Account No. 13-0235. If there are any questions, Patentee's Attorney should be contacted at the below listed telephone number.

Respectfully submitted,

By /Frederick J. Haesche/  
Frederick J. Haesche  
Registration No. 24,529  
Attorney for Patentee

Customer Number: 35301  
McCORMICK, PAULDING & HUBER  
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## UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 1

PATENT NO. : 7,247,822 B2

APPLICATION NO.: 10/772,641

ISSUE DATE : July 24, 2007

INVENTOR(S) : James J. Johnston

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 10, line 4, cancel the text beginning with "28. A method of making" to and ending "along its axial length." in column 10, line 18.

28. A method of making a heating element assembly comprising the steps of; continuously advancing an axially elongated first web of dielectric sheet material in an axial direction, simultaneously continuously advancing an axially elongate carbon fiber tow in said axial direction, moisturizing the tow, guiding the tow into axial alignment and overlying adhering engagement with the advancing first web, adhering the tow to the advancing first web, continuously advancing a second web of dielectric sheet material into overlying relation with marginal portions of the first web and the tow adhered to the first web, and joining only axially extending marginal portions of the first and second webs in face-to-face sealing engagement with each other to form an outer sheath containing the tow and embracing the tow along its axial length.

### MAILING ADDRESS OF SENDER (Please do not use customer number below):

McCormick Paulding & Huber LLP  
185 Asylum Street, CityPlace II  
Hartford, CT 06103-3410

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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## UNITED STATES PATENT AND TRADEMARK OFFICE

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McCormick, Paulding &amp; Huber

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/772,641	02/05/2004	James J. Johnston	6884-14	5776

7590 01/26/2005

Frederick J. Haesche  
McCormick, Paulding & Huber LLP  
CityPlace II  
185 Asylum Street  
Hartford, CT 06103

EXAMINER

FASTOVSKY, LEONID M

ART UNIT

PAPER NUMBER

3742

DATE MAILED: 01/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

502

DOCKET	
FILE	6884-0014
FOR	LOM 2/24/05
DATE	4/28/05 BY <i>mm</i>

# Office Action Summary

Application No.

10/772,641

Applicant(s)

JOHNSTON, JAMES J.

Examiner

Leonid M Fastovsky

Art Unit

3742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 18 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) 28 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27 and 29-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

TCL

DOCKET	
FILE	<u>6884-0019</u>
FOR	<u>LOM 2/26/05</u>
DATE	<u>1/31/05</u> BY <u>mmf</u>

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 05 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 20040602.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-27, 29-36, drawn to a heating element, classified in class 219, subclass 549.
  - II. Claim 28, drawn to a method of making a heating element, classified in class 29, subclass 611.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product can be made by a different process that does not include a simultaneous feeding of parts of the heating element.
3. Applicant's election without traverse of Claims 1-27 and 29-36 by Attorney J .Linderman by phone on 1/18/04 is acknowledged.
4. Claim 28 is withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected claim, there being no allowable generic or linking claim. Election was made **without** traverse by Mr. J.Linderman by phone on 1/18/04.
5. Upon further consideration the Election/Restriction of Species filed on 9/10/04 has been withdrawn.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 5, 8, 26, 27 and 35-36 rejected under 35 U.S.C. 103(a) as being unpatentable over Inagaki et al (6,737,586) in view of Goss et al (4,733,059).

Inagaki teaches a flat cable with an axially elongated flat copper or copper alloy heating element 5, and dielectric sheath 1,4 embracing the heating element 5, including a lower layer 1 having an upper face provided with an adhesive layer and bonded to the lower surface of the heating element, and an upper layer 4 having a lower face in direct contact and unconnected to the heating element 5. However, Inagaki does not teach a heating element comprises a carbon fiber. Goss teaches an elongated heating cable with carbon fiber heating elements 20. It would have been obvious to one having ordinary skill in the art to modify Inagaki's invention to include a carbon fiber heating element as taught by Goss in order to make the flat heating cable more durable.

8. Claims 2-16, 19, 21-25 and 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itagaki in view of Goss and further in view of McMahon et al (6,045,906) and Sundararaj et al (6,610,7730).

Itagaki in view of Goss teaches substantially the claimed invention, but does not teach the bundle with hundreds or thousands fibers and a diameter of the fiber, separate webs, polyester, Kapton material and resistance of the carbon fiber per linear foot.

McMahon discloses a bundle of carbon fibers ranging from 300 to 300,00 (col. 9, lines 57-65), separate webs (Fig. 1-2), thermoplastic material for the sheath comprising polyester (col. 2, lines 63-67) and Kapton (col. 14, lines 24-39). Sundararaj discloses a carbon fiber with diameter of 7 micron and a resistance of 15000 ohm per square cm (Table 1). It would have been obvious to one having ordinary skill in the art to modify the invention of Itagaki in view of Goss to use a bundle of carbon fiber, separate webs, polyester and Kapton material as taught by McMahon and a diameter and a resistance of the fiber as taught by Sundararaj in order to make the carbon heating element more durable.

9. Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itagaki in view of Goss and further in view of Kochman et al (6,452,138).

Itagaki in view of Goss discloses substantially the claimed invention, but does not disclose coloring to distinguish the layers. Kochman discloses a soft heating element (Fig. 1-2) and thread/fibers 2 can be laminated between color sensitive polymer 15 (col. 11, lines 20-57). It would have been obvious to one having ordinary skill in the art to modify the invention of Itagaki in view of Goss to adopt coloring of layer of polymer as taught by Kochman in order to distinguish it from non-colored.

10. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itagaki in view of Goss and further in view of Arx et al (6,541,744).

Itagaki in view of Goss discloses substantially the claimed invention, but does not disclose one layer being thicker than another. Arx discloses a heating element 16, a conductive carbon fiber (col. 1, lines 50-57) and one layer-section 14 is thicker than



Art Unit: 3742

another layer-section 12. It would have been obvious to one having ordinary skill in the art to modify the invention of Itagaki in view of Goss to include one layer thicker than another as taught by Arx in order to be more thermally isolative.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leonid M Fastovsky whose telephone number is 571-272-4778. The examiner can normally be reached on M-Th. 8.00 am -6.00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robin Evans can be reached on 571-272-4777. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Leonid M Fastovsky  
Examiner  
Art Unit 3742

Imf

1/21/05



ROBIN O. EVANS  
PRIMARY EXAMINER

1/24/05

~~Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.~~

Substitute for form 1449A/PTO

## INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	1	of	1
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**Complete if Known**

Application Number	10/772,641
Filing Date	February 5, 2004
First Named Inventor	James J. Johnston
Art Unit	Not yet known
Examiner Name	Not yet known
Attorney Docket Number	6884-0014

## U. S. PATENT DOCUMENTS

[illegible]

**FOREIGN PATENT DOCUMENTS**

[illegible]

**Examiner  
Signature**

Date	
Considered	

1/17/05

\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached.

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

6884-14

**Notice of References Cited**

Application/Control No.

10/772,641

Applicant(s)/Patent Under  
Reexamination  
JOHNSTON, JAMES J.

Examiner

Leonid M Fastovsky

Art Unit

3742

Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-6,737,586	05-2004	Inagaki et al.	174/110R
	B	US-6,610,773	08-2003	Sundararaj et al.	524/449
	C	US-6,045,906	04-2000	McMahon et al.	428/364
	D	US-4,733,059	03-1988	Goss et al.	219/548
	E	US-6,541,744	04-2003	Von Arx et al.	219/544
	F	US-6,452,138	09-2002	Kochman et al.	219/549
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

**FOREIGN PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
 Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date indicated below.

Amy B. Mantie

Typed or Printed Name of Person Sending Paper or Fee

Amy B. Mantie 5/26/05  
Signature Date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of	)	
James J. Johnston	)	Examiner: Fastovsky, Leonid M.
	)	
for CARBON FIBER HEATING	)	Group Art Unit: 3742
ELEMENT ASSEMBLY AND	)	
METHOD FOR MAKING	)	
	)	Confirmation No. 5776
Serial No.: 10/772,641	)	
	)	
Filed On: February 5, 2004	)	(Our Docket No. 6884-0014)

Hartford, Connecticut, May 26, 2005

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

Sir:

This is a response to the first action on the merits, mailed January 26, 2005, in the above-identified application.

Please amend the above-identified application as follows:

**Amendments to the Claims** begin on page 2 of this paper.

**Amendments to the Specification** begin on page 8 of this paper.

**Remarks/Arguments** begin on page 9 of this paper.

Amendment to the Claims:

1. (Currently Amended) A heating element assembly comprising; an electrical heating element including an axially elongated substantially flat bundle formed by a multiplicity of continuous axially extending carbon fibers which transforms electrical energy applied thereto into heat energy, said bundle having upper and lower surfaces including generally flat upper and lower surface portions substantially parallel to each other and a predetermined electrical resistance per unit of axial length, and a dielectric sheath embracing said bundle along its axial length, and including a lower layer having an upper face bonded to said lower surface of said bundle and an upper layer having a lower face disposed in overlying direct contacting engagement and unconnected relation to said upper surface of said bundle.

2. (Original) A heating element assembly as set forth in claim 1 wherein said bundle comprises from several hundreds to several tens of thousands of individual carbon fibers.

3. (Original) A heating element assembly as set forth in claim 1 wherein said bundle comprises a carbon fiber tow having from 1 thousand to 50 thousand generally cylindrical carbon fibers each having a diameter ranging from 6 to 10 microns.

4. (Original) A heating element assembly as set forth in claim 1 wherein said bundle comprises a carbon fiber tow having 50 thousand generally cylindrical fibers each having a 7 micron diameter.

5. (Original) A heating element assembly as set forth in claim 1 wherein said sheath comprises a thermoplastic material.

6. (Original) A heating element assembly as set forth in claim 5 wherein said thermoplastic material comprises a polyester.

7. (Original) A heating element assembly as set forth in claim 6 wherein said polyester comprises MYLAR.

8. (Original) A heating element assembly as set forth in claim 1 where said sheath comprises a thermosetting material.

9. (Original) A heating element assembly as set forth in claim 1 wherein said thermosetting material comprises a polyimide.

10. (Original) A heating element assembly as set forth in claim 9 wherein said polyimide comprises KAPTON.

11. (Original) A heating element assembly as set forth in claim 1 wherein said upper and lower layers are formed by separate webs of dielectric sheet material arranged in face-to-face relation to each other with said bundle therebetween and said layers have marginal portions extending outwardly in opposite transverse directions beyond longitudinally extending side edges of said bundle and bonded together and sealed in face-to-face relation to each other.

12. (Original) A heating element assembly as set forth in claim 11 wherein said upper face of said lower layer is bonded to said lower surface of said bundle and said marginal portions are bonded in face-to-face relation to each other by pressure sensitive adhesive.

13. (Original) A heating element assembly as set forth in claim 11 wherein said upper face of said lower layer is bonded to said lower surface of said bundle and said marginal portions are bonded in face-to-face relation to each other by heat activated adhesive.

14. (Original) A heating element assembly as set forth in claim 11 wherein said marginal portions are bonded together by ultrasonic welds.

15. (Original) A heating element assembly as set forth in claim 11 wherein said webs are of equal transverse width.

16. (Original) A heating element assembly as set forth in claim 11 wherein said webs are of unequal transverse width.

17. (Original) A heating element assembly as set forth in claim 1 including coding means for visually distinguishing said bonded lower layer from said unconnected upper layer.

18. (Original) A heating element assembly as set forth in claim 17 wherein said coding means comprises a color code.

19. (Original) A heating element assembly as set forth in claim 1 wherein said bundle has a terminal end portion projecting axially outwardly beyond an associated end of said upper layer and said lower layer has a bundle stabilizing tab projecting axially outwardly beyond said associated end in underlying relation and bonded to said terminal end portion.

20. (Original) A heating element assembly as set forth in claim 1 wherein the thickness of said lower layer is greater than the thickness of said upper layer.

21. (Original) A heating element assembly as set forth in claim 1 wherein said bundle has an electrical resistance in the range of 0.1 to 3.0 ohms/linear foot.

22. (Original) A heating element assembly as set forth in claim 1 wherein said bundle has an electrical resistance in the range of 2 to 3 ohms per linear foot.

23. (Original) A heating element assembly as set forth in claim 1 wherein said bundle has a thickness to width ratio of approximately one to twenty-five.

24. (Original) A heating element assembly as set forth in claim 1 wherein said bundle and said dielectric sheath are flexible.

25. (Original) A heating element assembly as set forth in claim 1 wherein said upper and lower layers have substantially the same thickness.

26. (Previously Presented) A heating element assembly comprising; an axially elongated flexible carbon fiber tow having a generally flat configuration and including from 1 thousand to 50 thousand axially elongated generally cylindrical continuous rectilinear axially extending carbon filaments having a diameter from 6 to 20 microns and arranged in immediately adjacent parallel relation to each other, said tow having an electrical resistance of 2 to 3 ohms per linear foot, and an outer jacket of polyester sheet material including two layers of said sheet material arranged in facing relation to each other with said tow disposed therebetween, one of said two layers being a substantially flat planar layer, one of said two layers having a thickness greater than the thickness of the other of said two layers, said tow adhered to one of said two layers, one of said two layers overlying said tow in direct contacting engagement and unconnected relation to said tow.

27. (Original) A heating element assembly comprising; a series of axially elongated axially parallel flexible carbon fiber tows of undetermined axial length each spaced from another and having interstacies therebetween, each of said tows including a multiplicity of continuous generally rectilinear axially parallel carbon filaments disposed in immediately adjacent relation to each other and having a predetermined electrical resistance per unit of tow axial length, and an outer insulating jacket of dielectric sheet material including a substantially flat planar first layer and a second layer, said tows adhered to said first layer, said second layer overlying said tows in direct contacting engagement with and unconnected relation to said tows and adhered in sealing relation to said first layer along said interstacies and along marginal portions of said outer insulating jacket immediately outboard of the outermost tows in said series.

28. (Withdrawn) A method of making a heating element assembly comprising the steps of; continuously advancing an axially elongated first web of dielectric sheet material in an axial direction, simultaneously continuously advancing an axially elongate carbon fiber tow in said axial direction, moisturizing the tow, guiding the tow into axial alignment and overlying adhering engagement with the advancing first web, adhering the tow to the advancing first web,



continuously advancing a second web of dielectric sheet material into overlying relation with marginal portions of the first web and the tow adhered to the first web, and joining only axially extending marginal portions of the first and second webs in face-to-face sealing engagement with each other to form an outer sheath containing the tow and embracing the tow along its axial length.

29. (Previously Presented) A heating element assembly as set forth in claim 26 wherein one of said two layers is wider than the other of said two layers.

30. (Previously Presented) A heating element assembly as set forth in claim 26 wherein said tow has an electrical resistance of 2 to 3 ohms per linear foot.

31. (Previously Presented) A heating element assembly as set forth in claim 26 wherein said carbon filaments have a diameter of substantially 7 microns.

32. (Previously Presented) A heating element assembly as set forth in claim 26 wherein said polyester sheet material comprises KAPTON.

33. (Previously Presented) A heating element assembly as set forth in claim 26 wherein said tow has a terminal end portion projecting axially outwardly from said outer jacket and one of said two layers has a tow stabilizing tab having a width substantially equal to the width of said tow and projecting axially outwardly from said outer jacket in underlying relation to said terminal end portion and bonded to said terminal end portion.

34. (Previously Presented) A heating element as set forth in claim 33 wherein said tow and said outer jacket are flexible.

35. (Previously Presented) A heating element assembly comprising; a flexible generally flat carbon fiber tow having a multiplicity of continuous generally rectilinear parallel carbon fibers extending in an axial direction, said tow having substantially flat upper and lower surfaces parallel to each other and a predetermined electrical resistance per unit of axial length, and an axially elongated outer jacket of dielectric sheet material including two layers of said sheet material arranged in face-to-face relation to each other with said tow disposed therebetween,

said two layers having marginal portions projecting outwardly in axially transverse directions from opposite sides of said tow, said marginal portions being bounded together and sealed in face-to-face relation to each other and extending in axial directions along said opposite sides of said tow, one of said two layers being bonded to one of said surfaces comprising said upper surface and said lower surface, one of said two layers being disposed in overlying direct contacting engagement and unconnected relation to one of said surfaces comprising said upper surface and said lower surface.

36. (Previously Presented) A heating element assembly as set forth in claim 35 wherein one of said two layers is a substantially flat planar layer.

Amendment to the Specification:

[0021] The illustrated heating element assembly 10 essentially comprises an axially elongated substantially flat bundle of individual continuous carbon fibers or filaments, which cooperate to form an electrical heating a heating element which transforms electrical energy applied thereto into heat energy, the flat bundle or heating element being designated generally by the reference numeral 12 and that individual fibers or filaments being indicated at 14, 14. The assembly 10 further includes an outer jacket or electrically insulating sheath, indicated generally at 6, formed by lower and upper layers of relative thin dielectric sheet material 18 and 20, respectively. The layers 18 and 20 are of equal width and thickness, and arranged in opposing face-to-face relation to each other with the heating element 21 disposed therebetween. The upper face of the lower layer 18 is bonded to the lower surface of the bundle 12, whereas the lower face of the upper layer 20 is disposed in direct contacting engagement with an in unconnected relation to the associated upper surface of the flat bundle 12, which it directly overlies and compliments.

## REMARKS

### Election/Restrictions

Withdrawal by the Examiner of the Election/Restriction of Species filed on September 10, 2004 is acknowledged by the Applicant.

Applicant confirms the election without traverse of claims 1-27 and 29-36 by attorney J. Linderman by phone on January 18, 2005.

Claim 28 is withdrawn from further consideration pursuant to 37 CFR 1.42(b) as being drawn to a non-elected claim.

### Claims Rejections 35 USC § 103

Each of the five independent claims presently under consideration, Claims 1, 26, 27, 35 and 36, are rejected under 35 USC § 103(a) as unpatentable over Inagaki, et al (6,737,586) in view of Goss, et al. (4,733,059).

Claim 1 and Claims 2-25, which depend directly or indirectly from Claim 1, have been amended. Consideration of claims 1-25 as amended, and reconsideration of Claims 26, 27 and 29-36, as originally submitted is respectfully requested for the reasons hereinafter set forth.

It is Applicant's contention that the present Office Action fails to establish a prima facie case of obviousness under 35 § 103(a) to support the rejection of any one of the claims under consideration, as originally filed, for reasons hereinafter set forth.

Section 103(a) of our patent statutes requires that the differences between the subject matter sought to be patented and the subject matter of the prior art, as a whole, at the time the invention was made, be determined and that against this background a further determination be made as to whether these differences would have been obvious to a person having ordinary skill in the art to which the subject matter pertains at the time the invention was made. It is applicant's contention that tenets of Section 103(a) are violated by the present office action in that the cited prior art is not considered as a whole and the differences between the subject matter sought to be patented and the subject matter of the prior art is not determined.

This fact is particularly true with regard to the difference between the invention sought to be patented and the primary reference, Inagaki '583, which

difference is not determined but is misrepresented in the present office action as will be hereinafter shown. The differences will now be considered.

The subject matter sought to be patented, as exemplified by claim 1, as originally filed, is an electrical heating element assembly (i.e., an electrical heating cable). The present action acknowledges that Claims 1-27 and 29-36, as originally filed, are drawn to a heating element classified in class 219, subclass 549 (see the present Office Action, page 2 Election/Restrictions paragraph 1). However, Claim 1 is currently amended to further identify the claimed heating element and to set forth its function, i.e. to transform electrical energy applied thereto into heat energy, so that there can be no possible misunderstanding as to the nature of the subject matter being claimed.

The primary reference, Inagaki, et al. '583, as a whole, discloses a flat cable and a manufacturing method therefore. The cable is an electric transmission cable used e.g. for wiring public utility apparatus, office automation apparatus, electronic parts mounted in vehicles, and the like (see Inagaki, column 1, lines 12-14). The disclosure of Inagaki et al '583 is well summarized in the Abstract of Inagaki which reads as follows:

A flat cable includes first and second insulator sheets, and a plurality of conductor elements arranged in parallel relation to one another over the length of the sheets. The first insulator sheet is provided with an adhesive layer. The conductor elements are interposed between the adhesive layer and the second insulator sheet. The first and second insulator sheets are first press-adhered under heat through the adhesive layer, and then bonded by an ultrasonic welding unit. The ultrasonic welding unit includes a horn for importing ultrasonic oscillations, and an anvil placed in opposition to the horn. The first and second insulator sheets are bonded in the zones which extend along the length of the sheets and are located outside the loci where the conductor elements are arranged. The bonding is performed either continuously or in an intermittent manner.

In the office action mailed January 26, 2005, at page 3, paragraph 7, the conductor element 5 of the Inagaki '583 is repeatedly referred to as "the heating element 5". It is further stated in paragraph 7 of the action;

However, Inagaki does not teach a heating element comprises a carbon fiber. Goss teaches an elongated heating cable with a carbon fiber heating element 20. It would have been obvious to one having ordinary skill in the art to modify Inagaki's invention to include a carbon fiber heating element as taught by Goss in order to make the flat heating cable more durable.

The primary reference, Inagaki '583 is not directed to a 'flat heating cable" nor is there any reference to a "heating element" or "heating element 5" in the Inagaki patent. The only reference to "heat" or "heating" found in the Inagaki patent are directed to the processes for manufacturing the Inagaki wiring cable and for scrapping its adhesive layer by burning that layer as part of a recycling process. The Inagaki patent does not contain even a remote suggestion that the flat wiring cable of Inagaki could be used as a heating cable to transform the electrical energy supplied to it into heat energy. Hence, it is applicant's contention that the present office action misrepresents the teaching of the prior art, Inagaki, when properly considered as a whole.

The secondary reference Goss '059 discloses an elongated parallel, constant wattage, heating cable and is described as relating to electrical heating cables that use an electrically resistive heating element in a parallel, constant wattage, zone-type construction. (see Goss "Field of the Invention", column 1, lines 6-10). The Goss heating element is comprised of a carbon, graphite or other non-metallic, conductive filament and has a high tensile strength and can withstand repeated thermal cycling without exhibiting physical or electrical damage. It is described as having an electrical resistance typically within the range of 2000 to 6000 ohms per foot. The Goss carbon fiber heating element is positioned between and parallel to two axially elongate parallel electrical conductors which are electrically connected at axially spaced apart intervals by axially transverse electrically conductive splices and provides the parallel electrical connections to the carbon fiber heating element therebetween.

It is Applicant's contention that the electrical conductors or splices 26, 26 of Goss are essential parts of the Goss heating element assembly, since these conducting splices are essential to the provision of multiple parallel connections to the heating element 20 which provide the zones necessary to attain constant wattage in the heating cable. The conductors 26, 26 do not render the heating cable of Goss suitable for use as general electrical transmission cable. Otherwise stated, the electrical conductors 24, 24 are provided for the sole purpose of supplying parallel electrical power to the high resistance heating element 20 to maintain constant wattage in the zones defined by the transverse electrically conductive splices 26, 26.

Reference is now made to page 3, paragraph 7 of the present Office Action where the basis for the rejection under 35 USC §103 (a) is set forth.

It is the Examiner's position that it would have been obvious to one having ordinary skill in the art to modify Inagaki's invention to include a carbon fiber heating element as taught by Goss in order to make the flat heating cable more durable. The flat heating cable to which the Examiner refers is actually the electrical transmission cable of Inagaki which is very clearly defined in the '586 patent specification as an electrical cable used e.g. for wiring public utility apparatus, office automation apparatus, electronic parts mounted in vehicles, and the like, as previous set forth.

It is Applicant's contention that there is no motivation for modifying the Inagaki invention to include a carbon fiber heating element as taught by Goss. The Examiner's position is based upon a fallacious assumption by the Examiner that Inagaki, et al. discloses a heating cable having a heating element 5. The Action makes repeated reference to the "heating element 5". The Inagaki specification is quite clear and defines the elements 5 as conductor elements. The Inagaki specification contains no reference to a heating cable or heating elements 5 such as found in the present Action.

Applicant contends that one having ordinary skill in the art at the time the present invention was made would have a level of skill in the art sufficient to enable appreciation of the difference between an electrical transmission cable (Inagaki '586) for use in electrical wiring to freely transmit or convey electrical current and an electrical resistance heating cable (Goss '059) for transforming electrical energy into heat energy. The Inagaki cable and the Goss cable are at opposite ends of the electrical cable spectrum. One is the antithesis of the other.

In the Summary of the Invention of the Goss patent, Goss states that the heating cable of the present invention has a heating element comprised of carbon, graphite, or other non-metallic, conductive filament and has a high tensile strength and can withstand repeated thermal cycling without exhibiting physical or electrical damage. The term high tensile strength is a relative one and is not supported by any data. In analytical data is provided by Goss to support only the reduction of thermal stress induced in the cables.

There is nothing in the Goss patent to suggest how the heating element of Goss might be used to modify the electrical transmission cable of the Inagaki. The only apparent suggestion for the modification of the invention of Inagaki in accordance with the teachings of Goss is the suggestion made by the Examiner

found in paragraph 7 of the present Office Action. The only support of the suggestions appears to be the Examiner's opinion that the Inagaki reference discloses a heating cable having a "heating element 5".

Assuming, for the purpose of argument, that the flat electrical transmission cable of Inagaki, et al. is modified "to include a carbon fiber heating element as taught by Goss in order to make the flat heating cable (the Inagaki cable) more durable", there is nothing offered in the Action to support the contention that modification of the Inagaki cable will improve the durability of the cable.

If the carbon fiber heating element of Goss is to function as a heating element in the hypothetical modifying cable of the primary reference Inagaki then the modification will have altered the operational principal of the primary reference, which is clearly intended to be simply a electrical transmission cable. Where are proposed modification changes or otherwise alters the operational principal of the reference being modified the teachings derived from the references are not sufficient to render the claims prima facie obvious.

Further assuming, for the purpose of argument, in the alternative that the carbon fiber element of the secondary reference Goss, et al. are carried forward into the primary reference leaving behind the heating function of the carbon fiber element so that the carbon fiber element functions only as a physical strengthening device to improve the durability of the primary reference, then there is a failure to consider the teachings of the secondary reference as a whole, in violation of 103(a) and the prima facie case of obviousness must fail for this reason.

Since all of the base claims, i.e., claims 1, 26, 27, and 35 are rejected under 35 USC §103(a) as unpatentable over Inagaki, et al. '586 in view of Goss, et al. '059. All of the arguments directed to the allowance of claim 1 apply with equal force to the remaining base claims and it is unnecessary to submit individual arguments regarding the remaining subordinate claims. However, since all of the subordinate claims are rejected under 35 USC §103(a) as unpatentable over Inagaki in view of Goss, et al. and further in view of McMahon, et al. (6,045,906) and Sundaraj et al (6,610,773) some comments regarding the McMahon and reference seem to be in order.

As the title to the McMahon patent suggests, the McMahon invention relates to processes for preparing fibers useful in forming or molding composite articles and more particularly relates to carbon fiber tows containing fiber blends, which are useful in preparing such composite articles (see McMahon, column 1, Background of



the Invention). In the present Office Action, paragraph 8, page 4, it is stated "McMahon discloses separate webs (Figs. 1-2) and thermal plastic material for "the sheath" comprising polyester (column 2, lines 63-67) and Kapton (column 14, lines 24-39)".

McMahon does not disclose separate webs in Figs. 1 and 2. Further, McMahon does not disclose a "sheath" as stated in paragraph 3 on page 4 of the present Office Action. The ABSTRACT and the SUMMARY OF INVENTION clearly state what is shown in Figs. 1 and 2 of McMahon, namely a process for making an intermixed tow which starts with a tow and ends with a tow. Clearly, no webs or sheath are shown or described. In fact, one cannot find the word "web" or "webs" or the words sheath at any point in the McMahon patent, although such structures are present in the invention sought to be patented. While the quoted statement from paragraph 3, page 4 of the present Office Action may be attributed to a mere careless use of words by the examiner, it works out to be a misrepresentation of that which is disclosed in Figs. 1 and 2 of the McMahon patent, which brings the cited reference into closer alignment with the invention sought to be patented. Actually, the tows produced in accordance with the McMahon patent are used to make composite molded articles which is abundantly clear from the title of the patent and the disclosed subject matter, when considered as a whole.

The prior art reference Sundararaj et al 6,610,773, when properly considered as a whole or in its entirety, teaches polyetherimide resin compositions having a conductive filler material such as carbon fiber, preferably having a diameter of about one to about twenty microns for making components such as computer chip trays and disk-shaped parts made by molding processes.

In the Office Action dated January 26, 2005, at page 3, paragraph 8, it is stated:

Sundararaj discloses a carbon fiber with a diameter of 7 micron and a resistance of 15000 ohm per square cm (Table 1). It would have been obvious to one having ordinary skill in the art to modify the invention of Inagaki in view of Goss to use a bundle of carbon fibers, separate webs, polyester a Kapon as taught by McMahon and a diameter and a resistance of the fiber as taught by Sundararaj in order to make the carbon heating element more durable.

The carbon fibers of Sundararaj (Table 1) available from Akzo, Diameter 7 micron, length 1/8 inch are filler materials for a resin molding material and not at all suitable for use in a heating cable, such as the cable of Goss.

Further it is Applicant's contention that the Examiner is employing hindsight to reconstruct Applicant's invention using Applicant's disclosure as a blue print for the reconstruction.

For the aforesaid reason, a prima facie case for obviousness has not been established. Accordingly, and in the absence of more pertinent art, it is respectfully submitted that all of the claims presently under consideration should be allowed.

A check in the amount of \$120.00 is included herewith to cover the fee for a one month extension of time or to file this response. Please charge any deficiency in the fee for entering this amendment to Deposit Account No. 13-0235.

Respectfully submitted,

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